

VERIFICATION OF TRANSLATION

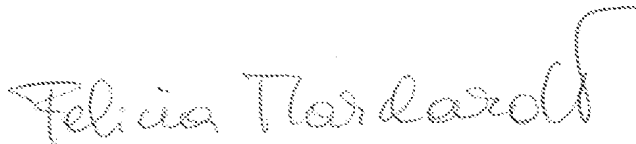
I, **Felicia Marchardt**, of
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declare as follows:

1. I am well acquainted with both the English and German languages, and
2. the attached document is a true and correct translation made by me to the best of my knowledge and belief of:

The priority document of the priority application No. **A 1023/2003**

Signature:

A handwritten signature in cursive script, reading "Felicia Marchardt". The signature is written in dark ink and is positioned to the right of the printed word "Signature:".

Date: 6 June 2011

1 The invention relates to spot welding tongs for robotic ap-
2 plications for the resistance welding of workpieces and, in par-
3 ticular, sheet metals, of the type including tong arms which are
4 each pivotally mounted on a base body and adjustable via an ac-
5 tuating means and to which electrode holders for the electrodes
6 are fastened, and further including winding means comprising a
7 wind-off roller and a wind-up roller for winding on and off a
8 strip for the protection of at least one electrode. The tong
9 arms pivotally mounted on the base body are pivoted relative to
10 each other in order to produce a spot weld and again pivoted
11 away from each other after completion of said spot weld.

12 The invention further relates to spot welding tongs for ro-
13 botic applications for the resistance welding of workpieces and,
14 in particular, sheet metals, of the type including tong arms
15 which are each pivotally mounted on a base body and adjustable
16 by an actuating means and to which electrode holders for the
17 electrodes are fastened.

18 From DE 197 54 546 C1, a spot welding tool comprising a
19 winding device for winding on and off a film strip transversely
20 contacting the electrode tip of the spot welding electrode is
21 known. The spot welding tool is equipped with an annular wind-
22 off coil for winding off the film strip and an annular wind-up
23 coil for winding up the film strip, and comprises an annular
24 driving means for the clocked rotation of the wind-up coil. The
25 wind-off coil, the wind-up coil and the driving means are adja-
26 cently arranged, coaxially with one another, around the elec-
27 trode shaft or electrode holder of the spot welding electrode. A
28 first setting roller is arranged obliquely to the electrode
29 shaft and at a radial distance from the wind-off coil, by means
30 of which first setting roller the film strip can be deflected
31 from the wind-off coil towards the electrode tip and placed in a
32 transverse position. Furthermore, a second setting roller is ar-
33 ranged obliquely to the electrode shaft and at a radial distance
34 from the wind-up coil, by means of which second setting roller
35 the film strip can be deflected from the electrode tip towards
36 the wind-up coil and placed in a transverse position, wherein
37 the two setting rollers are arranged in an opposed relationship
38 laterally of the electrode shaft.

1 A similar configuration is also known from JP 05 192 774, in
2 which the wind-up and wind-off coils are likewise arranged on
3 the electrode shaft or electrode holder, respectively.

4 The previously mentioned designs involve the disadvantage
5 that the accessibility of the spot welding tool is greatly re-
6 stricted because of the arrangement of the wind-up and wind-off
7 coils in the region of the electrode shaft or electrode holder,
8 since a substantial enlargement of the spot welding tongs in the
9 end region and, in particular, in the welding zone is caused. As
10 a result, only easily accessible workpieces can be spot-welded
11 by a spot welding tool of this type.

12 Other constructions of spot welding devices including strips
13 for the protection of the electrodes are known from JP 10 029
14 071 A, JP 08 118 037 A, JP 04 322 886 A or JP 05 192 774 A. In
15 those spot welding tools, the strip, which is supplied and dis-
16 charged via a winding device, is positioned above the electrode,
17 likewise as a protection against any contact of the electrode
18 with the workpiece or structural component, so that the strip
19 will contact the workpiece or structural component during a spot
20 welding process. In doing so, the wind-up and wind-off coils are
21 arranged and fixed independently of the spot welding tool.

22 There, it is disadvantageous that a very large space is re-
23 quired such that the direct application is only feasible with
24 flat workpieces. An automatic use, particularly with robots, is
25 therefore not possible.

26 Another, very essential disadvantage of the above-mentioned
27 prior art devices resides in that the strip is pulled over the
28 electrode during conveyance, thus causing an elevated electrode
29 wear on account of the friction occurring between the electrode
30 and the strip.

31 The object of the present invention, therefore, resides in
32 providing spot welding tongs for robotic applications for the
33 resistance welding of workpieces, with which the accessibility
34 is not substantially affected and a very simple and compact de-
35 sign of the spot welding tongs including an electrode protection
36 strip is provided. In addition, an exchange of the strip is to
37 be feasible as simply and rapidly as possible.

1 According to another object of the present invention, the
2 structure of the tong arm is to be as light-weight and compact
3 as possible.

4 The first object of the invention is achieved in that the
5 wind-off roller and the wind-up roller of the winding means are
6 arranged on the base body or on the tong arm, and that at least
7 one guiding groove is provided on the tong arm and/or on the
8 electrode holder for the guidance of the strip.

9 According to another characteristic feature of the inven-
10 tion, it is provided that means for guiding and deflecting the
11 strip, in particular deflection pulleys and slide surfaces, are
12 provided on the tong arm and/or electrode holder.

13 The wind-off roller and/or the wind-up roller of the winding
14 means is coupled with a driving means and, in particular, an
15 electronically activatable motor.

16 If the tong arm is formed by a base section and side pieces
17 are arranged on either side of the base section to project be-
18 yond the base section, and the thus formed depression is de-
19 signed as a guiding groove for the strip, the manufacture of the
20 tong arm will be simple.

21 If at least one cover plate is arranged on the end sides of
22 the side pieces to cover the guiding groove formed between the
23 side pieces, the guiding groove will be protected from foreign
24 matter or possible soiling.

25 It is also feasible to form the tong arm by a base section
26 with a guiding groove being incorporated in the base section. In
27 this case, the guiding groove is worked into the base section,
28 for instance, by milling.

29 The retrofitting of existing spot welding tongs without ma-
30 jor expenditures is possible in that the guiding groove is
31 formed by additional guiding elements which are provided on the
32 tong arm and/or electrode holder, for instance slipped on or
33 screwed on.

34 A particularly simple variant embodiment is also provided in
35 that the tong arm is comprised of several individual components
36 which are connected with one another in a manner that a hollow
37 space is formed in the center of the tong arm for the guidance

1 of the strip.

2 According to another characteristic feature of the inven-
3 tion, a braking device is provided to fix and tension the strip,
4 said braking device being preferably arranged in the region of
5 the wind-off or wind-up roller to prevent the electrode protec-
6 tion strip from canting and sagging.

7 If the braking device is connected with a control unit, a
8 suitable control of the braking device is feasible.

9 The further object of the invention is achieved by above-
10 described spot welding tongs in which the tong arms are each
11 comprised of a main element which is prestressed by at least one
12 drag strut or a drag rope. It is, thus, advantageously ensured
13 that substantially simplified exchanges of the winding means as
14 well as of the strip will be feasible due to the arrangement of
15 the winding means within the base body or even on the tong arms.
16 Another advantage is the substantially improved accessibility of
17 the electrode holder and the electrode to complex workpieces or
18 sheet metals, the latter being in fact be more easily reached
19 due to the slim design of the electrode holder and electrode. In
20 this context, it is advantageous that the main element of the
21 tong arm can be substantially smaller dimensioned, since the ma-
22 jor portion of the forces acting on the tong arm will be taken
23 up by the prestressed drag struts or a drag rope.

24 Further configurations are described in subclaims 12 to 18.
25 The resulting advantages may be taken from the description.

26 The present invention will be explained in more detail by
27 way of the accompanying drawings.

28 Therein:

29 Fig. 1 is a perspective view of spot welding tongs according
30 to the invention;

31 Fig. 2 is a perspective view of a tong arm of the spot weld-
32 ing tongs according to the invention;

33 Fig. 3 is a sectional illustration of the tong arm along the
34 sectional line III-III of Fig. 2;

35 Fig. 4 is another perspective view of a tong arm of the spot
36 welding tongs according to the invention;

1 Fig. 5 is again a sectional illustration of the tong arm
2 shown in Fig. 4 along the sectional line V-V of Fig. 4;

3 Fig. 6 is another perspective view of a tong arm of the spot
4 welding tongs according to the invention;

5 Fig. 7 is a sectional illustration of a tong arm along the
6 sectional line VII-VII of Fig. 6;

7 Fig. 8 is another perspective view of a tong arm of the spot
8 welding tongs according to the invention;

9 Fig. 9 is again a sectional illustration along the sectional
10 line IX-IX of Fig. 8;

11 Figs. 10 and 11 are perspective views of the spot welding
12 tongs according to the invention.

13 Fig. 1 depicts spot welding tongs 1 for robotic applications
14 for the resistance welding of workpieces and, in particular,
15 sheet metals in a perspective view, with only one half of the
16 spot welding tongs being shown for reasons of clarity.

17 The spot welding tongs 1 are comprised of a base body 2 and
18 tong arms 3 on which electrode holders 4 and electrodes 5 are
19 arranged and around which circulating strips 6 run to protect
20 the electrodes 5. The strip 6 is wound off a winding means 7
21 which may preferably be arranged on the base body 2, yet also on
22 the tong arms 3, and is guided along the tong arm geometry over
23 the tong arm 3, the electrode holder 4 and the electrode 5, and
24 again back to the winding means 7 on the opposite side.

25 The electrode 5 is especially configured with a view to us-
26 ing the strip 6. Yet, it is, of course, also possible to use any
27 electrode 5 known from the prior art. On the electrode 5, which
28 is located in the interior of the assembly, a spacer 5a and a
29 pressure element 5b are arranged in the region of an electrode
30 cap so as to be movably connected with the electrode 5 in the
31 longitudinal direction of the same, said pressure element 5b ex-
32 erting a force on the spacer 5a. The spacer 5a and the pressure
33 element 5b each comprise a guide for the strip 6 to enable the
34 strip 6 to be kept at a distance from the electrode 5. The spac-
35 er 5a lifts the strip 6 off the electrode surface or electrode
36 cap during or after the opening of the spot welding tongs 1,
37 whereas the spacer 5a is pushed back during a welding process,

1 i.e., with the spot welding tongs 1 closed, so as to cause the
2 electrode 5 or electrode cap to contact the strip 6. In doing
3 so, a pressure or force is additionally exerted on the workpiece
4 or sheet metal by the spacer 5a on account of the pressure ele-
5 ment 5b so as to prevent, for instance, the process-inherent
6 bending or bulging of the sheet metals or structural components.
7 When using such an electrode 5, or an electrode assembly of this
8 type, it is ensured that the strip 6 does not directly contact
9 the electrode cap with the spot welding tongs 1 opened, so that
10 the strip 6 will be prevented from producing friction on the
11 electrode 5 during its displacement, thus substantially increas-
12 ing the service life of the electrode 5.

13 In order to enable the strip 6 to be brought near the elec-
14 trode 5, means and, in particular, deflection pulleys and slide
15 surfaces 9 are arranged on the tong arm 3 and/or on the elec-
16 trode holder 4 to guide and deflect the strip 6. In doing so,
17 the strip 6 extends from a wind-off roller 10 mounted within the
18 winding means 7, via guiding grooves 8 or a channel of the elec-
19 trode holder 4 to the electrode 5, and from there again via the
20 electrode holder 4 and guiding grooves 8, or a channel, to a
21 wind-up roller 11, which is again arranged within the winding
22 means 7. The wind-off roller 10 and/or the wind-up roller 11 are
23 coupled with a driving means 12 and, in particular, an electron-
24 ically activatable motor so as to enable the selective displace-
25 ment of the strip 6 by the activation of said driving means 12.

26 The wind-off roller 10 and the wind-up roller 11 are de-
27 signed with a view to enabling the simple and uncomplicated ex-
28 change or replacement of the rollers or the strip 6. To this
29 end, the wind-off roller 10 and wind-up roller 11 are mounted in
30 the base body 2, or in the tong arm 3, so as to be readily ex-
31 changeable, whereby automatic coupling to the driving means 12
32 is provided at a use of the wind-off roller 10 and/or the wind-
33 up roller 11. By arranging the wind-off roller 10 and the wind-
34 up roller 11 as well as the driving means 12 on the base body 2,
35 or even on the tong arms 3, easier access to the coils will be
36 ensured, thus rendering an exchange of the wind-off roller 10
37 and wind-up roller 11 substantially easier and simpler. Another
38 positive effect of this arrangement of the wind-off roller 10
39 and wind-up roller 11 consists in that no interfering elements

1 or parts are present by guiding the strip 6 from behind, i.e.,
2 from the base body 2, to the electrode 5, which, as a result,
3 allows for the nearly problem-free realization of a spot weld
4 even on workpieces that are difficult to access, because there
5 is no limitation of accessibility as opposed to welding tongs
6 having no strip 6. This configuration further enables the struc-
7 tural dimensions of the spot welding tongs 1 to be kept small.

8 For the sake of completeness, it is pointed out that the
9 tong arms 3 are adjustably mounted and adjusted by an actuating
10 means 13 which may, for instance, be comprised of a servomotor
11 or a cylinder 14.

12 Fig. 2 depicts a tong arm 3 of spot welding tongs 1 in a
13 perspective and schematically simplified view, and Fig. 3 is a
14 sectional view of the tong arm 3 along the sectional line III-
15 III of Fig. 2. The wind-off roller 10 and the wind-up roller 11
16 of the winding means 7 are arranged in the base body 2 (not il-
17 lustrated), to which the tong arm 3 is fastened.

18 In this embodiment, the tong arm 3 of the spot welding tongs
19 1 is made of a base section 15 on which side pieces 16 are ar-
20 ranged on either side, which project beyond the base section 15
21 so as to form a depression, which serves as a guiding groove 8
22 for the strip 6. The side pieces 16 may be of aluminum, thus of-
23 fering an enormous weight saving. Naturally, the side pieces 16
24 may be made of any other suitable material. The guiding groove 8
25 is designed in a manner that the surface along which the strip 6
26 runs serves as a slide surface 9.

27 On the end sides 17 of the side pieces 16 a cover plate 18
28 is preferably arranged to cover the guiding groove 8 formed be-
29 tween the side pieces 16. Thus, the strip 6 is not only better
30 guided, but the strip 6 and the guiding groove 8 as well as the
31 slide surface 9 are, moreover, protected from contaminations of
32 any kind, since the strip 6 extends "in the open" only from the
33 region of the electrode 5.

34 In Figs. 4 and 5 a further embodiment of a tong arm 3 of
35 spot welding tongs 1 is illustrated. The wind-off roller 10 and
36 the wind-up roller 11 of the winding means 7 are in this case
37 integrated in the tong arm 3. Furthermore, the guiding groove 8
38 is incorporated in the base section 15 of the tong arm 3, ex-

1 tending from the beginning of the tong arm 3, i.e. from the po-
2 sition of the wind-off roller 10 or wind-up roller 11, as far as
3 to the electrode 5. The guiding groove 8 is preferably made by
4 milling out of the base section 15. In doing so, the guiding
5 groove 8 may again be covered by a cover plate 18. With such a
6 construction, the tong arm 3 is comprised of few parts only.

7 Another exemplary embodiment is apparent from Figs. 6 and 7.
8 There, the guiding groove 8 is formed by additional guide ele-
9 ments 19 which are slipped or screwed on the tong arm 3 and/or
10 the electrode holder 4. The guide elements 19 are, thus, de-
11 signed as accessory components and fastened to the base section
12 15. This enables commercially available spot welding tongs 1 to
13 be converted to belt systems without having to exchange or work
14 the tong arms 3 and/or electrode holder 4. The guide elements 19
15 may be made of synthetic, but also any other materials.

16 The winding means 7, the wind-off roller 10 and the wind-up
17 roller 11 may likewise be designed as accessory elements and
18 subsequently mounted to the base body 2 or tong arm 3 in a sim-
19 ple form (not illustrated).

20 As in correspondence with Figs. 8 and 9, the tong arm 3 may
21 also be composed of several individual components 20 which are
22 connected to form a hollow space 21 in the center of the tong
23 arm 3 for the strip 6 to run therethrough. The individual compo-
24 nents 20 may be screwed or plugged together. Naturally, the tong
25 arm 3 may also be formed by a section tube on which incorporated
26 guiding grooves 8 may be arranged both on the inner sides and on
27 the outer sides of the section tube.

28 In a preferred manner, a braking device 22 for the strip 6
29 is provided in the region of the wind-off roller 10 and/or wind-
30 up roller 11, which braking device is activated by a control
31 unit 23 and keeps the strip 6 taut. It is thereby prevented that
32 the strip 6 gets jammed within the hollow space 21 or in the
33 guiding groove 8, or sags loosely around. The braking device 22
34 may likewise be used in the previously described embodiments and
35 is preferably integrated in the winding means 7. A detailed il-
36 lustration has been omitted, since the design may be manifold.
37 The braking device 22 might be formed by two relatively movable
38 pressure elements between which the strip 6 is guided and which

1 are moved onto the strip 6 with the braking device 22 activated,
2 thus fixing the strip 6. The function of the braking device 22,
3 therefore, resides in fixing the strip 6 after a continued move-
4 ment of the same so as to keep the strip 6 always taut.

5 Fig. 10 perspectively illustrates spot welding tongs 1 for
6 robotic applications for the resistance welding of workpieces
7 and, in particular, sheet metals. Pivotally mounted tong arms 3
8 including electrode holders 4 for accommodating electrodes 5 are
9 again fastened to base bodies 2. The tong arms 3 are adjustable
10 by the aid of an actuating means 13 (cf. Fig. 1). The actuating
11 means 13 may be comprised of a servomotor or a cylinder 14 or
12 any other possible actuating option.

13 In these spot welding tongs 1, a main element 24 is pre-
14 stressed by at least one drag strut or a drag rope 25. The tong
15 arm 3 may, for instance, be comprised of a main element 24 and
16 at least one retaining plate 26 fastened to the main element 24.
17 The main element 24 is preferably comprised of a round section.
18 A drag strut or a drag rope 25 is fastened to one or several
19 points of the retaining plate 26 and connected with the main el-
20 ement 24. The drag strut, or the drag rope 25, is fastened to
21 that side of the main element 24, on which the electrode holder
22 4 extends. It is, furthermore, possible to arrange a holding
23 strut, or a holding rope 27, on the opposite side of the drag
24 strut or drag rope 25.

25 The tong arm 3 is connected with the base body 2 and, in
26 particular, a reception element 28 via the retaining plate 26.
27 It is, of course, also possible to do without a retaining plate
28 26 and connect the main element 24 as well as the drag rope 25,
29 and optionally the holding rope 27, directly with the reception
30 element 28. In doing so, it is essential that the drag rope 25
31 and the holding rope 27 are arranged on one side of the main el-
32 ement 24 in a spaced-apart relationship relative to the main el-
33 ement 24, and that both the drag rope 25 and the holding rope 27
34 are connected with the main element 24 or a fastening element
35 (not illustrated) arranged on the main element 24. It is, thus,
36 ensured that appropriate traction and holding forces are built
37 up on the main element 24 of the tong arm 3 via the drag rope 25
38 and/or the holding rope 27. To this end, the drag strut or drag

1 rope 25 and/or the holding strut, or holding rope 27, are ar-
2 ranged at an angle of, preferably, between 10° and 30° relative
3 to the main element 24, which means that they extend at an angle
4 relative to the surface of the main element 24 at least over a
5 partial region. It is, in fact, possible that the drag rope 25
6 and/or the holding rope 27 are guided in parallel with the sur-
7 face of the main element 24 over a partial region, while, howev-
8 er, extending angularly in the connection zone, as is, for in-
9 stance, illustrated in Fig. 11.

10 Such a configuration of the tong arm 3 enables the main ele-
11 ment 24 to have a very small cross section, since the pressure
12 forces of the spot welding tongs 1 are taken up via the drag
13 rope 25 and/or the holding rope 27. The weight of the spot weld-
14 ing tongs 1 will, thus, be considerably reduced.

15 Fig. 11 depicts another exemplary embodiment comprising such
16 a tong arm system including ropes or struts. Here, the main ele-
17 ment 24 of the tong arm 3 extends beyond the base body 2 of the
18 spot welding tongs 1, whereby the tong arm is movably mounted
19 within the base body 2, and the two base bodies 2 are mounted to
20 be movable relative to each other. The tong arm 3 projects be-
21 yond the base body 2 on the side opposite to where the electrode
22 holder 4 is fastened and is movably mounted in the base body 2
23 while forming a lever. The tong arm portion projecting beyond
24 the base body 2 is connected with the actuating element 13. The
25 actuating element 13 may be comprised of a cylinder 14. By dis-
26 placing the cylinder 14, the tong arm 3 is displaced in a manner
27 that the two electrodes 5 are pressed at each other or moved
28 away from each other, respectively.

29 In the exemplary embodiment illustrated in Fig. 11, several
30 holding plates 26 are arranged on the tong arm 3, particularly
31 on the main element 24, to guide the drag rope 25 and the hold-
32 ing strut, or holding rope 27, in a spaced-apart manner. The
33 drag rope 25 is fastened with the reception element 28 to the
34 base body 2 and to the tong arm 3, whereas the holding rope 27
35 extends from the end region of the tong arm 3 with the electrode
36 holder 4 to the opposite side of the base body 2 and, there, is
37 connected with the tong arm 3. This is also possible with the
38 drag rope 25.

1 It is essential with such spot welding tongs 1 that the
2 forces acting during the forcing together of the spot welding
3 tongs 1 be taken up via the drag rope 25 and the holding rope 27
4 so as to enable the main element 24 to be substantially smaller
5 dimensioned. A very substantial weight saving is, thus, achieved
6 in a simple manner.

7 For the use of the strip 6 as a protection of the elec-
8 trodes, the retaining plates 26 include appropriate openings
9 which are, at the same time, used as a guiding groove 8 or chan-
10 nel. The wind-off roller 10 and the wind-up roller 11 may be in-
11 tegrated in the base body 2 (cf. Fig. 1).

12

1 Claims:

2

3 1. Spot welding tongs (1) for robotic applications for the re-
4 sistance welding of workpieces and, in particular, sheet metals,
5 of the type including tong arms (3) which are each pivotally
6 mounted on a base body (2) and adjustable via an actuating means
7 (13) and to which electrode holders (4) for the electrodes (5)
8 are fastened, and further including winding means (7) comprising
9 a wind-off roller (10) and a wind-up roller (11) for winding on
10 and off a strip (6) for the protection of at least one electrode
11 (5), characterized in that the wind-off roller (10) and the
12 wind-up roller (11) of the winding means (7) are arranged on the
13 base body (2) or on the tong arm (3), and that at least one
14 guiding groove (8) is provided on the tong arm (3) and/or on the
15 electrode holder (4) for the guidance of the strip (6).

16

17 2. Spot welding tongs according to claim 1, characterized in
18 that means for guiding and deflecting the strip (6), in particu-
19 lar deflection pulleys and slide surfaces (9), are provided on
20 the tong arm (3) and/or electrode holder (4).

21

22 3. Spot welding tongs according to claim 1 or 2, characterized
23 in that the wind-off roller (10) and/or the wind-up roller (11)
24 is coupled with a driving means (12) and, in particular, an
25 electronically activatable motor.

26

27 4. Spot welding tongs according to one or several of claims 1 to
28 3, characterized in that the tong arm (3) is formed by a base
29 section (15), and that side pieces (16) are arranged on either
30 side of the base section (15) to project beyond the base section
31 (15), and the thus formed depression is designed as a guiding
32 groove (8) for the strip (6).

33

34 5. Spot welding tongs according to claim 4, characterized in
35 that at least one cover plate (18) is arranged on the end sides
36 (17) of the side pieces (16) to cover the guiding groove (8)

1 formed between the side pieces (16).

2

3 6. Spot welding tongs according to one or several of claims 1 to
4 3, characterized in that the tong arm (3) is formed by a base
5 section (15) with the guiding groove (8) being incorporated in
6 the base section (15).

7

8 7. Spot welding tongs according to one or several of claims 1 to
9 3, characterized in that the guiding groove (8) is formed by ad-
10 ditional guiding elements (19) which are provided, for instance
11 slipped or screwed, on the tong arm (3) and/or electrode holder
12 (4).

13

14 8. Spot welding tongs according to one or several of claims 1 to
15 3, characterized in that the tong arm (3) is comprised of sever-
16 al individual components (29) which are connected with one an-
17 other in a manner that a hollow space (21) is formed in the cen-
18 ter of the tong arm (3) for the guidance of the strip (6).

19

20 9. Spot welding tongs according to one or several of claims 1 to
21 8, characterized in that a braking device (22) is provided to
22 fix and tension the strip (6).

23

24 10. Spot welding tongs according to claim 9, characterized in
25 that the braking device (22) is connected with a control unit
26 (23).

27

28 11. Spot welding tongs (1) for robotic applications for the re-
29 sistance welding of workpieces and, in particular, sheet metals,
30 of the type including tong arms (3) which are each pivotally
31 mounted on a base body (2) and adjustable via an actuating means
32 (13) and to which electrode holders (4) for the electrodes (5)
33 are fastened, characterized in that the tong arms (3) are each
34 comprised of a main element (24) which is prestressed by at
35 least one drag strut or a drag rope (25).

1

2 12. Spot welding tongs according to claim 11, characterized in
3 that at least one retaining plate (26) is arranged on the main
4 element (24) of the tong arm (3), via which retaining plate the
5 at least one drag strut or the drag rope (25) is guided in a
6 spaced-apart relationship relative to the main element (24).

7

8 13. Spot welding tongs according to claim 11 or 12, character-
9 ized in that the main element (24) is formed by a round section.

10

11 14. Spot welding tongs according to one or several of claims 11
12 to 13, characterized in that the at least one drag strut, or the
13 drag rope (25), is arranged on that side of the main element
14 (24), on which the electrode holder (4) extends.

15

16 15. Spot welding tongs according to one or several of claims 11
17 to 14, characterized in that a holding strut or a holding rope
18 (27) is provided in addition to the at least one drag strut or
19 drag rope (25), respectively.

20

21 16. Spot welding tongs according to one or several of claims 11
22 to 15, characterized in that the at least one drag strut, or the
23 drag rope (25), and/or the holding strut, or the holding rope
24 (27), are arranged at an angle of between 10° and 30° relative
25 to the main element (24) of the tong arm (3).

26

27 17. Spot welding tongs according to one or several of claims 11
28 to 16, characterized in that the drag strut, or the drag rope
29 (25), and optionally the holding strut, or the holding rope
30 (27), extend from that side of the main element (24), to which
31 the electrode holder (4) is attached, as far as to the opposite
32 side of the base body (2) on the main element (24).

33

34 18. Spot welding tongs according to one or several of claims 11
35 to 17, characterized in that guiding grooves (8) are formed on

1 the tong arms (3) to each receive a strip (6) for the protection
2 of the electrodes (5) according to claims 1 to 10.

3

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1 Abstract:

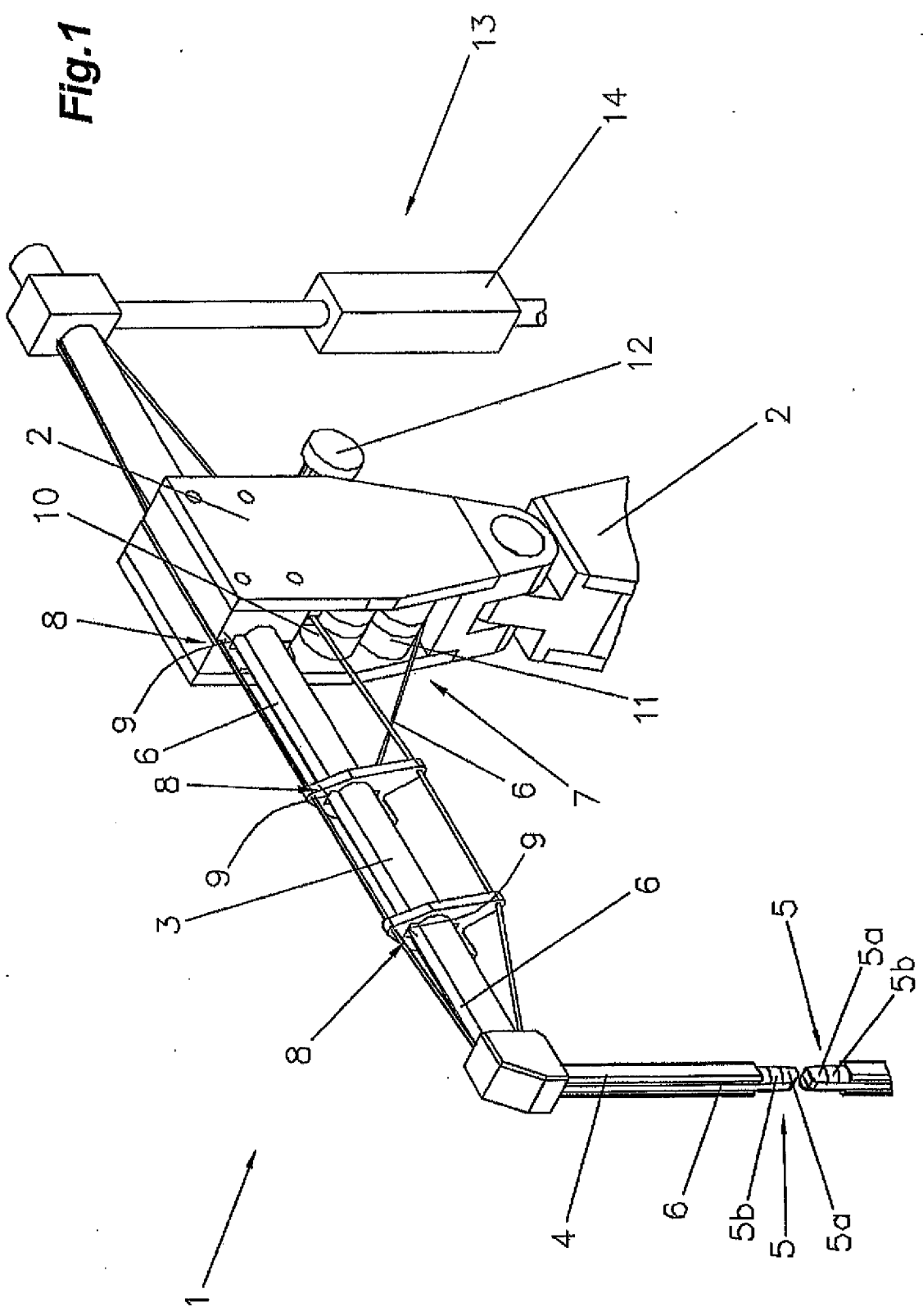
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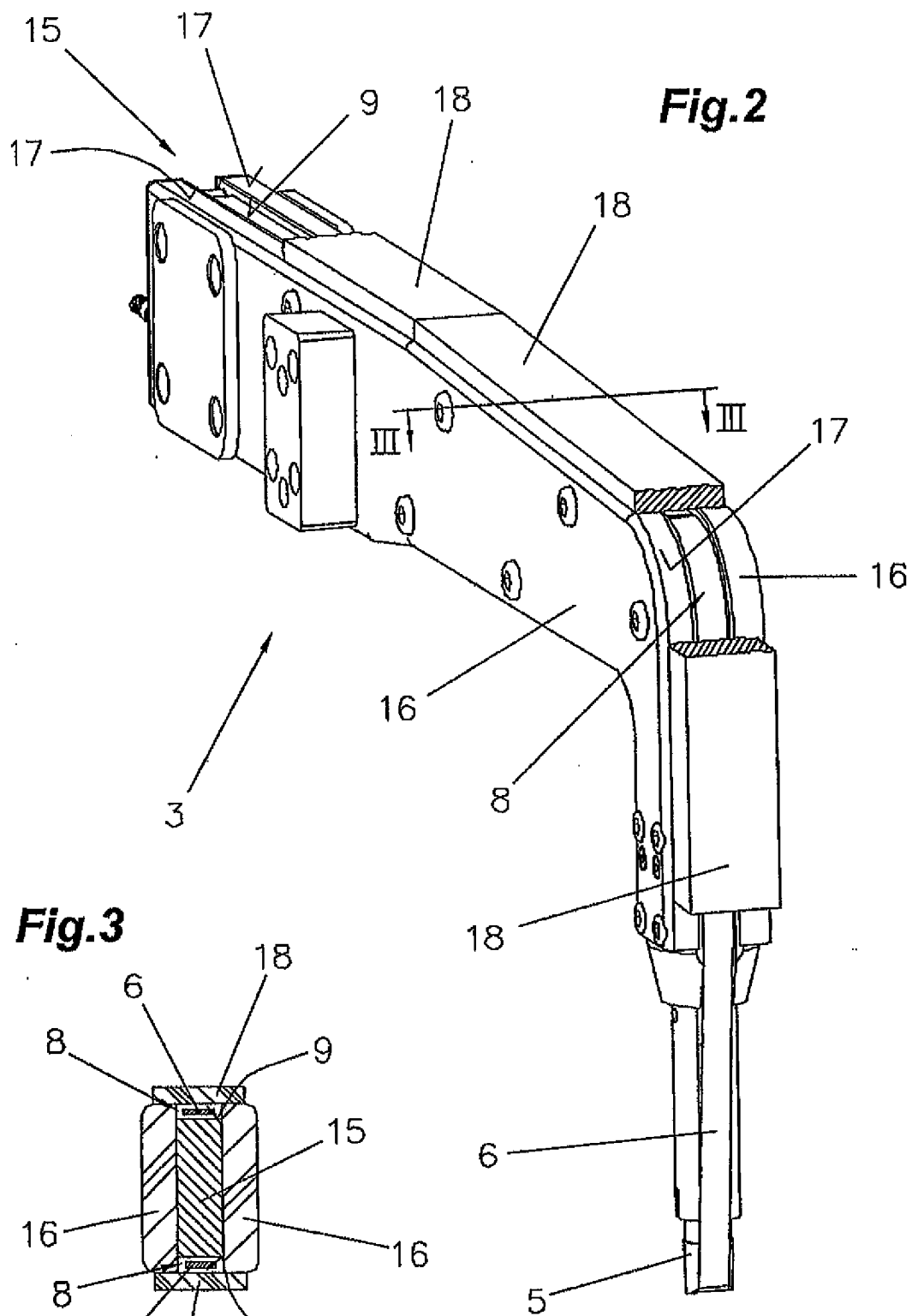
3 The invention relates to spot welding tongs (1) for robotic ap-
4 plications for the resistance welding of workpieces and, in par-
5 ticular, sheet metals, of the type including tong arms (3) which
6 are each pivotally mounted on a base body (2) and adjustable via
7 an actuating means (13) and to which electrode holders (4) for
8 the electrodes (5) are fastened, and further including winding
9 means (7) comprising a wind-off roller (10) and a wind-up roller
10 (11) for winding on and off a strip (6) for the protection of at
11 least one electrode (5). To create such spot welding tongs (1)
12 in which the accessibility is not essentially affected and is
13 combined with a very simple and compact construction, it is pro-
14 vided for the wind-off roller (10) and the wind-up roller (11)
15 of the winding means (7) to be arranged on the base body (2) or
16 on the tong arm (3), and for at least one guiding groove (8) to
17 be provided in the tong arm (3) and/or in the electrode holder
18 (4) for the guidance of the strip (6).

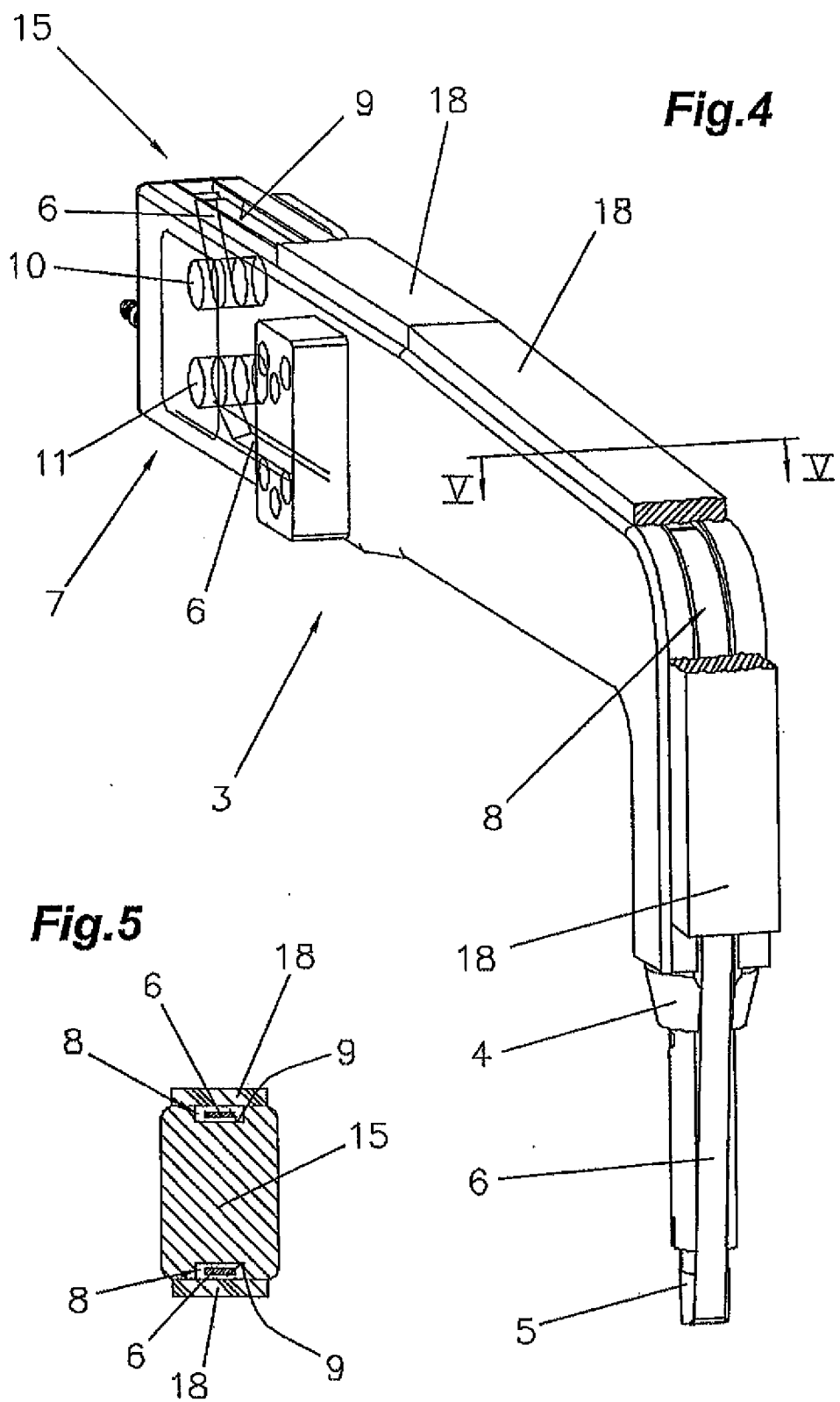
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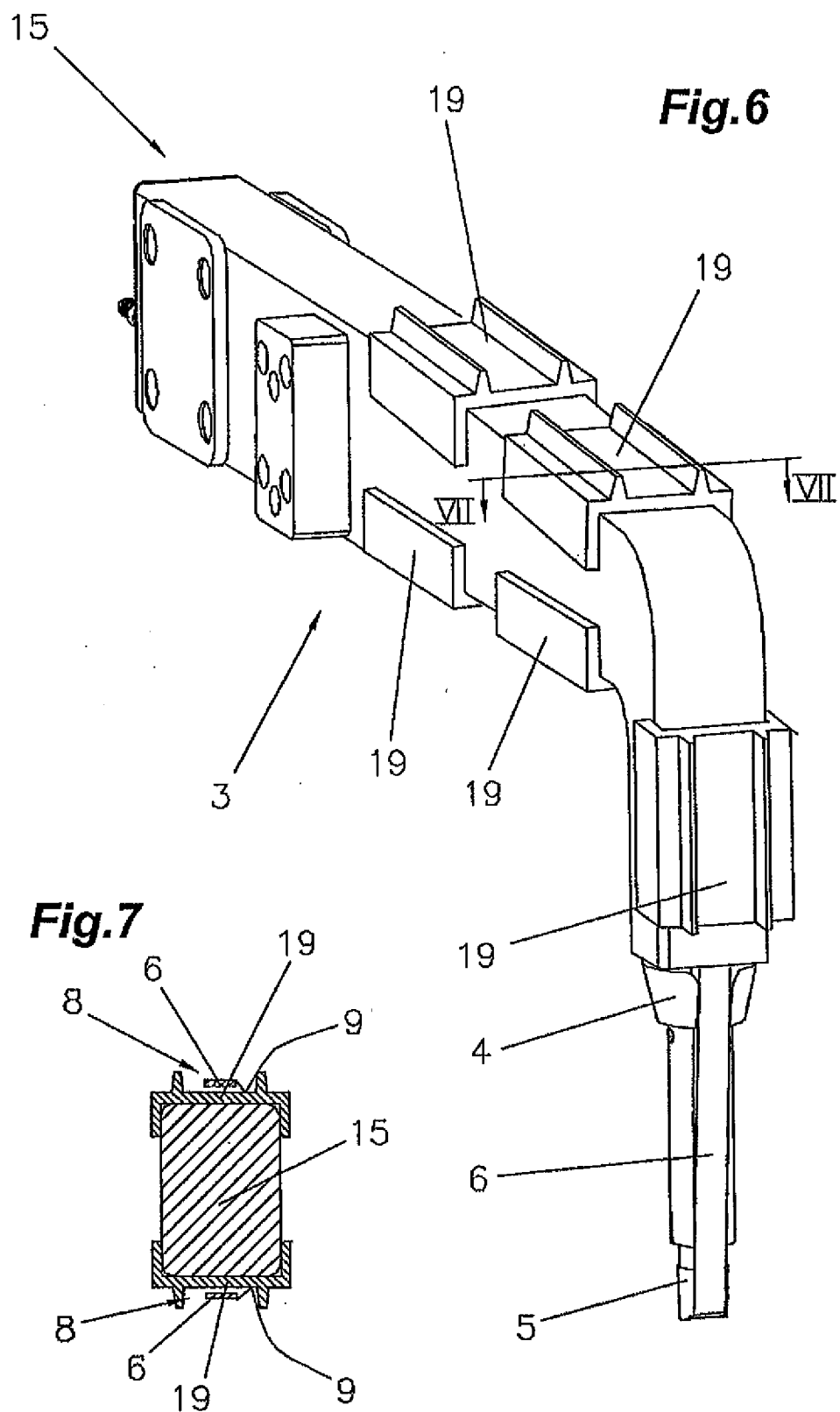
20 (Fig. 1)

Fig.1









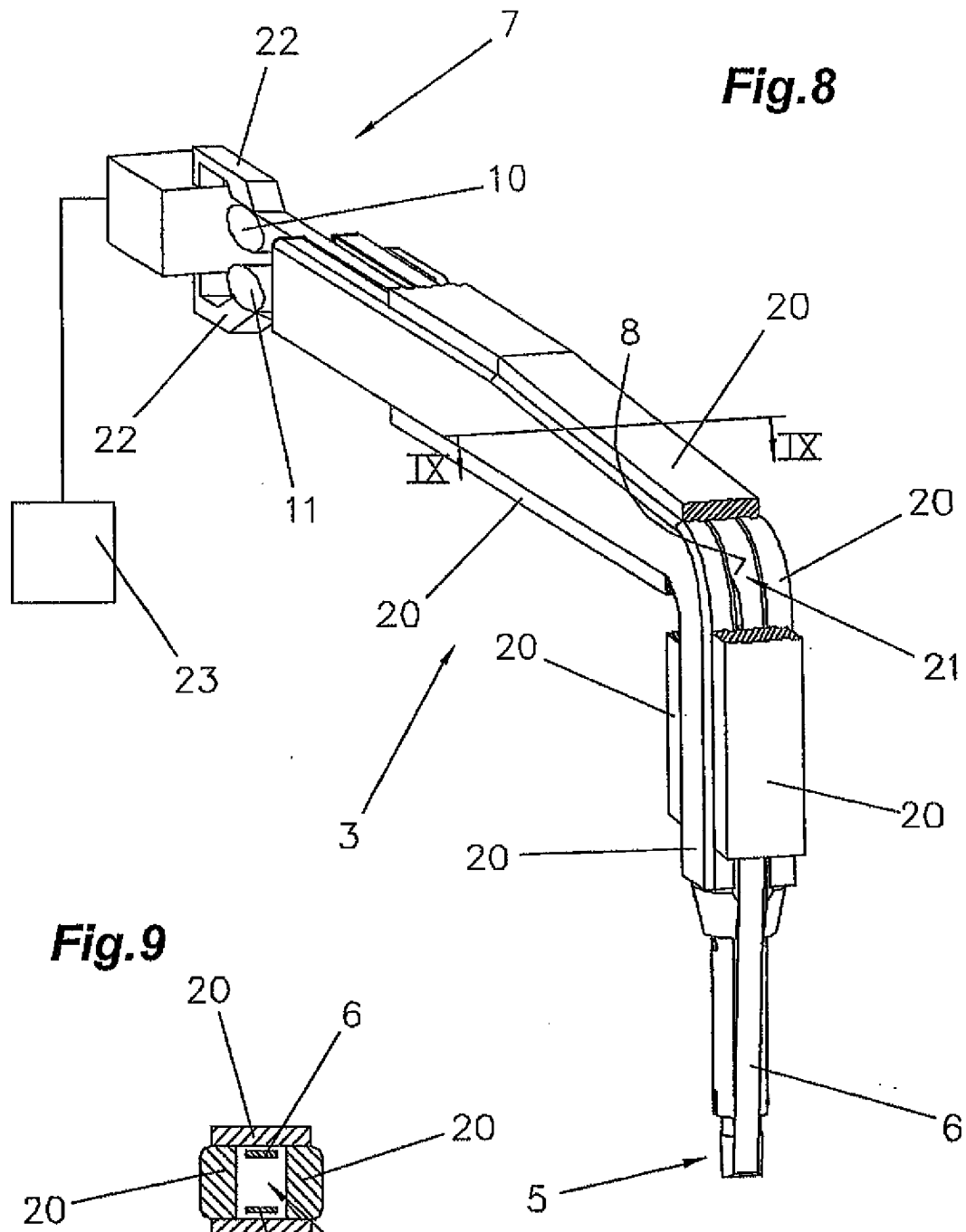


Fig.10

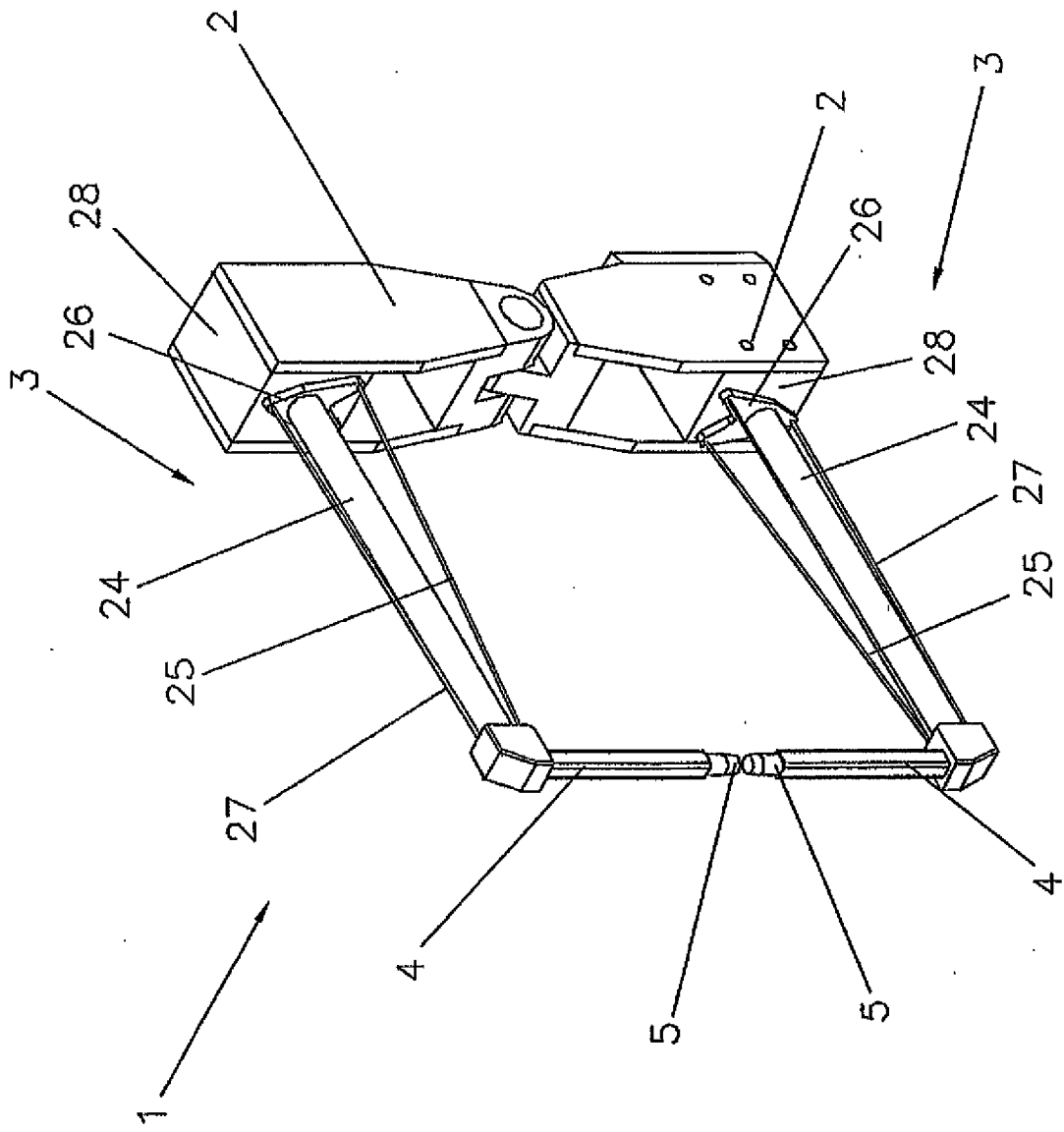


Fig.11

